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POLICY RESEARCH WORKING PAPER

Inflation in Nontradables and the Macroeconomic Policy Mix

A Model with Policy Application to Transition Economies

Hana Polackova

How a price increase in the nontradables sector of a transition economy affects the exchange rate, relative prices, wages, and, indirectly, the movement of factors of production.

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Summary findings

Polackova analyzes the macroeconomic effects of inflation in the nontradables sector of a small open economy to suggest how different macroeconomic policies would facilitate structural adjustment after price liberalization in a transition economy.

She uses a Mundell-Fleming rational expectations model of a two-sector economy to study how inflation in the nontradables sector affects the exchange rate, relative prices, wages, and, indirectly, the movement of factors of production. She applies the analysis to a cut in producer subsidies in the nontradables sector and assesses how macroeconomic policies involving the management of

supply and demand might affect government objectives for the economy and redistribution.

She concludes that to alleviate the transitory negative effects of a cut in producer subsidies, targeted household transfers combined with a tax cut, if possible, are superior to expansionary monetary and fiscal policies. Making the tax cut less than the cut in subsidies and financing targeted lump-sum household transfers from government savings reduce the risk of poverty and external imbalances. The potential benefits from exchange rate management depend greatly on the level of wage discipline.

This paper — a product of the Country Operations Division, Europe and Central Asia, Country Department II — is part of a larger effort in the department to support countries in continuing and sustaining social and economic growth. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Hana Polackova, room H11-013, telephone 202-473-0182, fax 202-477-1692, Internet address hpolackova@worldbank.org. February 1997. (28 pages)

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1. Introduction

The paper analyzes the macroeconomic effects of an exogenous increase in the cost of production of nontradables in a small open economy and examines the policy implications of a cut in the subsidy to nontradables production in a transition economy. It develops a Mundell-Fleming rational expectations model of a two-sector economy, studies the effects of nontradables inflation on the exchange rate and on the relative price of nontradables and tradables, and examines the indirect impact of nontradables inflation on the wage level and the movement of production factors. It then applies the analytical results to a cut in the subsidy to production of nontradables and considers the effectiveness of government policies to moderate the required structural adjustment in a transition economy. Finally, it examines the effect of the subsidy cut on the government's primary major macroeconomic objectives, including macroeconomic stability, economic growth, employment, and poverty alleviation.

2. Effects of Inflation in Nontradables

2. 1. Model

The economy modeled is a small, open, two-sector economy that produces traded and nontraded goods. Production in both sectors takes place along a concave transformation curve. The labor force is fixed, and both labor and capital are mobile between the two sectors in the medium run.

The model is derived from the Mundell-Fleming model (Mundell 1967; Fleming 1962) and the Keynesian rational expectations model (Dornbusch 1976, 1980, and 1988)¹ and is based on four assumptions. First, purchasing power parity holds for the tradable goods in the long run and the equilibrium price of tradables is thus established by world markets and the exchange rate. Second, the goods market adjusts slowly to disequilibria (prices are sticky in the short run), and

temporary deviations from the full-employment output level may occur. Third, the exchange rate and the interest rate adjust instantaneously, and uncovered interest parity holds. Fourth, expectations are formed rationally.

The basic expression of the model includes five equations in a loglinear specification:

$$(1) \quad p_T = p_T^* + s$$

$$(2) \quad i = i^* + ds/dt$$

$$(3) \quad m - p = \xi y - \varphi i$$

$$(4) \quad y_N = \epsilon_N(p_T - p_N) - \omega_N(i - dp/dt) - \theta_N f + g$$

$$(5) \quad y_T = \epsilon_T(p_N - p_T) - \omega_T(i - dp/dt) - \theta_T f + \zeta y^*,$$

where a small letter denotes the log of each variable.

Equation (1) stems from the purchasing power parity (PPP) of traded goods in the long run. The equilibrium domestic currency price of the traded good, p_T , is a function of its foreign currency price, p_T^* , and the domestic currency price of foreign exchange, s . Since the economy is a price taker in the world market, price, p_T^* , is determined exogenously.

Equation (2) captures the uncovered interest parity under rational expectations, where i represents the domestic interest rate, i^* represents the foreign interest rate, and ds/dt represents the expected exchange rate depreciation.

Equation (3) is the equilibrium condition for the money market, where m is the nominal money supply, p is the price index, y is output and ξ , φ are constant positive parameters (the elasticity of money demand with respect to domestic output and with respect to the interest rate, respectively).

Equations (4) and (5) show the condition for the goods market equilibrium in the separate sectors, where ϵ_N is the elasticity of aggregate demand for nontradables with respect to the real exchange rate, q ($q = p_T/p_N$); ϵ_T is the elasticity of aggregate demand (domestic and foreign) for domestically produced tradables with respect to the relative price of nontradables, p_N/p_T ; ω_N is the elasticity of private expenditure for nontradables with respect to the real interest rate, $i-dp/dt$; ω_T is the elasticity of private expenditure for tradables with respect to the real interest rate; θ_N is the elasticity of private expenditure for nontradables with respect to the income tax rate, f ; θ_T is the elasticity of private expenditure for the tradables with respect to the income tax rate; and ζ is the elasticity of demand for tradables with respect to foreign absorption, y^* . Aggregate demand for nontradables is positively related to the real exchange rate and to government spending, g .² The aggregate demand for tradables is positively related to the relative price of nontradables and to foreign absorption. Demand for both nontradables and tradables is negatively related to the income tax rate and to the real interest rate. The sum $y_N + y_T = y$ defines aggregate domestic output. Although the simplicity of the model is achieved at the expense of the measurement unit (which is a composite of nontradables and tradables), the model nevertheless proves useful.

The domestic price index, p , is defined as the expenditure weighted average of the prices of nontraded and traded goods:

$$(6) \quad p = (1-\alpha)p_N + \alpha p_T, \text{ and } 0 < \alpha < 1,$$

where α is the expenditure share for tradables and $(1-\alpha)$ is the expenditure share for nontradables. If tradables and nontradables are not substitutable, α is constant. (In the section on policy analysis this assumption is relaxed to allow for a substitution effect, and α rises with the relative price, p_N/p_T .)

Using this price index and equation (1), it is possible to decompose the domestic inflation rate:

$$(7) \quad dp/dt = [\alpha dp_T + (1-\alpha)dp_N]/dt = [\alpha(dp_T^* + ds) + (1-\alpha)dp_N]/dt \\ (1-\alpha) d(p_N/p_T)/dt + ds/dt + dp_T^*/dt$$

The changes in the relative price, the exchange rate, and the foreign currency price for tradables are interrelated, as explained below. If the foreign currency price of tradables is assumed to be constant, the steady state of an internal full-employment equilibrium and the external balance are characterized by stability in both the exchange rate, $ds/dt = 0$, and in the relative price,

$$d(p_N/p_T) = 0.^3$$

In the goods market, aggregate output, $y_N + y_T$, is assumed to converge to its steady state full-employment level in the long run. In the short run, however, the output level may deviate from the full employment equilibrium, \bar{y} . In such a case, a pressure will be exerted on the domestic price level:

$$(8) \quad dp/dt = \mu(y_N + y_T - \bar{y}),$$

where μ is a constant positive parameter that captures the response of the domestic price index to the change in the level of output. Domestic supply of and demand for tradables are equilibrated by net exports; the market for nontradables, however, clears only *ex post*. As is shown later, the direct price response to a discrepancy between output and demand occurs only in the nontradables sector. Indirectly, through the wage level, inflation may be generated by excess employment in both sectors.

2. 2. Adjustment in the Exchange Rate and the Relative Price

The dynamics of the adjustment in the exchange rate, s , and in the relative price, p_N/p_T , are first modeled with respect to an exogenous price shock in one sector. The level of the exchange rate and of the relative price fully determines whether the economy finds itself in internal and external equilibrium.

The model is solved in matrix form:

$$\begin{pmatrix} ds/dt \\ d(p_N/p_T)/dt \end{pmatrix} = kA \begin{pmatrix} s \\ p_N/p_T \end{pmatrix} + kB \{f \ g \ m \ y \ i^* \ p_T^* \ y^*\},$$

where k is a positive composite of several parameters.

For simplicity, let $\epsilon_T = \epsilon_N = \epsilon$, $\omega_N + \omega_T = \omega$ and $\theta_N + \theta_T = \theta$. Since aggregate demand for tradables is more sensitive to the real exchange rate than is demand for nontradables with respect to the relative price, then $\epsilon_T > \epsilon_N$ and $\epsilon > 0$.⁴ As for price stickiness, since $(1-\mu)\omega > 0$, then

$$A = \begin{pmatrix} -(1-\mu)\omega & -\epsilon\xi - (1-\alpha)(1-\mu)\omega \\ -1/(1-\alpha) & -[\epsilon(\xi - \mu\varphi) - (1-\alpha)]/(1-\alpha) \end{pmatrix}$$

$$B = 1/(1-\alpha) *$$

$$* = \begin{pmatrix} \xi\theta(1-\alpha) & -\xi(1-\alpha) & (1-\mu)\omega(1-\alpha) & -\xi\mu\omega(1-\alpha) & [\xi\omega + \varphi(1-\mu)\omega]/(1-\alpha) & -(1-\mu)\omega(1-\alpha) & -\xi\xi(1-\alpha) \\ \theta(\xi - \varphi\mu) & (\varphi\mu - \xi) & 1 & \varphi\mu & \xi\omega + \varphi(1-\mu)\omega & -1 & \xi(\varphi\mu - \xi) \end{pmatrix}$$

and

$$k = 1/[\xi\omega + \varphi(1-\mu)\omega].$$

The determinant of the transition matrix A is negative, implying that the dynamics in the model exhibit saddle-point stability. The relative price is a predetermined variable, whereas the

exchange rate jumps as a forward-looking variable. Moreover, since prices are sticky, the full burden of the adjustment is carried by the exchange rate in the short run.

Figure 1 illustrates the dynamics of the adjustment in the exchange rate and in the relative price to an exogenous shock. Equilibrium is achieved where the curve representing steady state of the exchange rate, $ds/dt = 0$, and curve representing steady state of the relative price, $d(p_N/p_T)/dt = 0$, intersect. The slopes of both curves are negative because

$$(1-\mu\omega)/[-\epsilon\xi - (1-\alpha)(1-\mu\omega)] < 0 \quad \text{and} \\ 1/[-\epsilon(\xi-\mu\varphi) - (1-\alpha)] < 0.$$

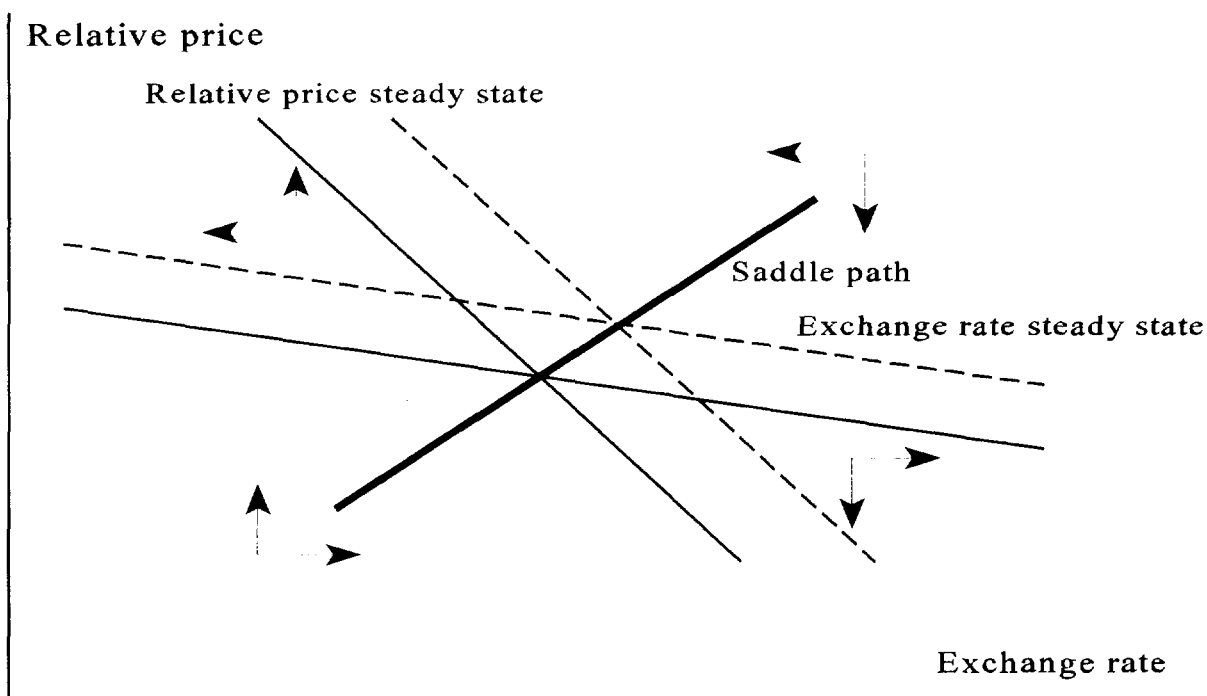
If the elasticity of money demand with respect to output and price stickiness are relatively high, and the elasticities of demand with respect to the real interest rate are relatively low in both sectors, then $\mu\omega < \xi$, and in absolute values:

$$|(1-\mu\omega)/[-\epsilon\xi - (1-\alpha)(1-\mu\omega)]| < |1/[-\epsilon(\xi-\mu\varphi) - (1-\alpha)]|$$

Therefore, in figure 1, the slope of the relative price steady state is steeper than the slope of the exchange rate steady state, and it holds unambiguously that:

$$|-\epsilon(\xi-\mu\varphi) - (1-\alpha)| < 0, \quad |-\epsilon\xi - (1-\alpha)(1-\mu\omega)| < 0.$$

Figure 1. Dynamics of adjustment in the exchange rate and the relative price of nontradables



The figure helps demonstrate the effect of inflation in nontradables on relative prices and the exchange rate. Consider an exogenous increase in the price of nontradables. In response, the relative price steady state line shifts upward, with the extent of the shift reflecting the size of the shock. (Since the model assumes that the substitution elasticity of demand equals zero, no change in the relative consumption shares is considered.)

In the short run the exchange rate steady state line shifts to the right, reflecting the instantaneous change in the exchange rate to accommodate the decline in the real money supply - according to equation (2) through an increase in the interest rate. This shift also reflects the expected adjustment in relative prices to accommodate the decline in the demand for

nontradables, reflecting the elasticities ϵ_N and ω_N in equation (4). In the tradables sector domestic demand declines as well. But in a small open economy foreign demand allows the market for tradables to clear immediately at the world price level. In figure 1, the change in the exchange rate moves the intersection of the relative price and exchange rate back on the saddle path. As a result of the depreciation in the exchange rate, the domestic currency-denominated price of tradables rises, reducing the relative price.

In the medium run the intersection of the relative price and the exchange rate moves along the saddle path to a new equilibrium. This movement shows the adjustment of the price of tradables to the depreciation in the exchange rate, and of the price of nontradables to the new demand levels.

The values of the parameters characterizing the economy determine whether the exchange rate overshoots. If the exchange rate overshoots in the short run as prices catch up to accommodate the initial shock and the relative price is declining, then in the medium term the exchange rate will appreciate along the saddle path (while the interest rate declines to its original level, given by the international financial market), thus partly offsetting its initial depreciation. Without any overshooting in the short run, the exchange rate rises and will continue to depreciate along the saddle path as the relative price rises (after its initial rise, the interest again declines). In both cases, in the new equilibrium, both the exchange rate level and the relative price level are higher.⁵

2. 3. Macroeconomic Imbalance and Wages

Allow tradables and nontradables to be substitutable, and consider an exogenous shift in consumer tastes toward nontradables. Because of the temporary rigidities in factor mobility the market for nontradables fails to satisfy its equilibrium condition (4) in the short run,⁶ and the excess demand

in the nontradables market leads to upward pressure on the price of nontradables.⁷ The degree of price pressure depends on the price and substitution elasticities of demand. The increase in the relative price brings about a partial offsetting of the initial demand shift toward tradables (α rises toward its initial level).⁸

In the short run, to satisfy equation (4), the price of nontradables and the exchange rate move together with the exchange rate moving more than the price of nontradables. Thus, because of excess demand in nontradables the exchange rate depreciates. According to the purchasing power parity condition (1), the domestic currency-denominated price of tradables increases as the exchange rate depreciates, partly offsetting the increase in the relative price. Figure 1 illustrates that the instantaneous shift of the exchange rate steady state line is greater than the short-term shift of the relative price steady state line. Thus, in the short run, the exchange rate depreciates to a greater extent and the relative price of nontradables rises.

Further adjustment occurs along the saddle path. The increase in the domestic price of tradables that occurs because of changes in the exchange rate partly offsets the previous demand shift toward tradables. However, as the nominal money supply is considered constant, the equilibrium in the nontradables sector is maintained through the income effect. Consistent with the long-term condition of external equilibrium (5), the decline in domestic demand from the tradables sector is accompanied by a positive impact on the trade account. (If a trade deficit appeared in the short run, a trade surplus during the long-term adjustment would compensate for it while boosting the money supply through an inflow of international reserves. In the long run the trade account would reach balance.)

In contrast to the nontradables sector, in a small open economy the market for tradables clears immediately, with net exports equal to the difference between domestic demand for and supply of domestically produced traded goods.⁹ A gap between domestic supply and demand in the tradables sector thus does not affect the price of tradables. A persistent real excess demand in the domestic tradable sector depreciates the domestic currency and reduces the relative price in the long run.¹⁰

The model presented above does not analyze the supply side of the economy and, so far, the analysis treats nominal wages as constant. To extend the analysis assume that the increase in domestic prices induces an increase in nominal wages, and external macroeconomic imbalance occurs. Any increase in wages would offset the initial negative income effect and thus slow down the adjustment process. The extent to which an increase in wages translates into a further increase in prices in each sector depends on the shares of wages in production costs. If, for example, the production of nontradables is more labor intensive than the production of tradables, the rise in wages would increase the relative price of nontradables. Furthermore, in an open economy an increase in wages that is not tied to improvement in productivity generates a current account deficit and depreciation of the domestic currency.¹¹ In turn, the lower real value of the domestic currency would offset the increase in real wages. This process may continue in a spiral, as wage pressure (particularly wage increases tied to indexation) appears to be self-generating.

As rational wage setters internalize the initial increase in the price of nontradables (foreseeing the rise in the price of tradables), production costs in both sectors increase and the nominal wage rises with the level of the price index. In the long run:

$$(9) \quad dw/dt = \gamma [\alpha dp_N/dt + (1-\alpha)ds/dt] \quad \text{and} \quad 0 < \gamma < 1,$$

where γ represents the sensitivity of wages to a change in the domestic price index. If there is absolute real wage rigidity, $\gamma = 1$. High elasticity of the nominal wage with respect to the price of nontradables intensifies the spillover of inflation in the nontradables sector. Tendency toward real wage rigidity would thus prolong long-term adjustment.

2. 4. Monetary Consequences and Factor Reallocation

In this section, the analysis of the effects of nontradables inflation is extended to both the money and goods markets. Assume that the price of nontradables rises exogenously and that the nominal money supply and nominal wages are held constant. The increase in the relative price of nontradables and the depreciation of the domestic currency would induce both monetary and structural adjustment.

Equations (2) and (3) and the analysis in section 2.2 imply that an exogenous increase in the price of nontradables would temporarily raise the domestic real interest rate and reduce the demand for money by reducing the real money supply and depreciating the domestic currency. As reflected in the equations (4) and (5), an increase in the domestic real interest rate brings about a decline in the demand for both traded and nontraded goods. The extent of the decline depends on the sensitivity of demand to the real interest rate.¹²

The change in the relative price of nontradables provides the principal incentive for factor allocation and provides a link between the model and the supply side of the economy.¹³ In the medium term in a small, open economy with imperfect factor mobility, structural adjustment led by an increase in the relative price of nontradables would generate unemployment in the nontradables sector and a decline in the size of the domestic economy, even if foreign demand for tradables is able to accommodate an unlimited quantity of domestically produced tradable goods.

3. Reduction in the Production Subsidy to Nontradables and Macroeconomic Policies

3.1. Policy Objectives

What happens if the government decides to cut an existing producer subsidy in the nontradables sector? Assume that the government intends to continue to protect equity in nontradables consumption but attempts to minimize the distortions in prices and in factor allocation in the economy. Following the announcement of the subsidy cut, the objectives of the government are to control inflation, maintain external stability, and prevent unemployment and poverty.¹⁴ Comparative statics and the adjustment dynamics presented in sections 2.1 and 2.2 can be used to study the consequences of alternative policies.

A cut in the producer subsidy to the nontradables sector represents a negative supply side shock. Producers of nontradables immediately translate the subsidy cut into a price increase, and production profitability is not necessarily affected.

On the demand side the initial increase in the relative price instantaneously affects demand patterns as consumers switch from nontradables to tradables (equations 4 and 5). This change in demand sets a constraint on the supply of nontradables and further affects the price of nontradables and the current account balance.¹⁵

At the beginning of the long-term adjustment process the relative price reflects the price shock (from the negative shock in the supply of nontradables), the immediate change in the price of nontradables (from the substitution and negative income effects in domestic demand) and the (mathematical) effect of the instantaneous exchange rate depreciation on the price of tradables denominated in the domestic currency. A detailed analysis of both the short- and long-term adjustments can be performed based on sections 2.2-2.4.

3. 2. Demand Management

Demand shocks, such as expansionary fiscal and monetary policies, could temporarily affect the relative price and thus moderate the effects of the cut in the subsidy. To assess the effectiveness of the financial policies in the Mundell-Fleming model assume a flexible exchange rate and imperfect capital mobility.¹⁶ Monetary expansion would offset the temporary increase in the domestic interest rate (as discussed in sections 2.2-2.4) and boost aggregate domestic demand.¹⁷ Thus, in the short run expansion in the money supply could counterbalance the decline in demand for nontradables, particularly if price elasticity is low.

Unless the price elasticity of demand for tradables is zero, the monetary expansion would also increase domestic demand for tradables. Excess demand for tradables in the domestic market would lead to a current account deficit, to excess demand for foreign exchange and to further depreciation of the domestic currency. Moreover, the need to generate a current account surplus in the future would require even greater structural adjustment.

Thus, an expansionary monetary policy only postpones and magnifies the extent and consequences of the necessary structural adjustment. By raising inflationary expectations and wage pressures, monetary expansion endangers macroeconomic stability. In Poland, Russia and Ukraine, where the money supply had been expanded in an attempt to dampen the effects of subsidy cuts, strict monetary tightening and welfare cuts were necessary to re-establish macroeconomic stability.¹⁸

On the fiscal front, to moderate the contraction of the economy and employment during the adjustment process, the government could accompany the cut in the producer subsidy in the nontradables sector by increasing own purchases of nontradables.¹⁹ To allow for gradual factor

reallocation the government would gradually reduce its purchases of nontradables. Such demand management would, however, add uncertainty to the adjustment process; similar results could be achieved simply by reducing the subsidy gradually. The model can be used to show the long-run change in the relative price of nontradables and the exchange rate with respect to a change in government expenditure and the nominal money supply. The analysis in section 2.2 can be extended to illustrate the dynamics of the adjustment in interest rates, prices, and outputs in both sectors.

Throughout the adjustment process the additional government demand for nontradables would maintain their relative price at a higher level. It is possible that by moderating the movement in the relative price and thus reducing pressure on factor reallocation, the higher relative price would expand the time and cost of the structural adjustment. The higher price level in the nontradables sector would also magnify inflationary wage pressure and exaggerate the shift in private demand toward tradables. If domestic demand for tradables is elastic, the demand shift toward tradables would exacerbate the risk of external instability. The problem with adopting a gradual approach to adjustment and an expansionary fiscal policy is illustrated in Hungary, where the negative short-term effects of subsidy cuts were reduced at the cost of macroeconomic balance and certainty in the economy.

3. 3. Exchange Rate Policy

Assume that a fixed exchange rate regime is introduced at the time of the cut in the producer subsidy in the nontradables sector. Because a small, open economy must accept a fixed price of tradables (from the PPP condition). Relative prices would adjust to the subsidy cut solely through

changes in the price of nontradables. To sustain the fixed exchange rate and avoid the need for deflation, the exchange rate would have to be devalued.

Devaluation would lower the relative price of nontradables by automatically raising the domestic price of tradables. The analysis in section 2.2 indicates that devaluation would also increase the price of nontradables, although less than proportionately. Thus, although devaluation adds to inflation, it creates room to accommodate an exogenous increase in the price of nontradables.

By softening the short-term increase in the relative price of nontradables, devaluation mitigates the decline in demand for nontradables and eases the process of structural adjustment. Moreover, if nominal wages are held constant, devaluation cuts real wages, boosting employment in both sectors. Devaluation also adds to the increase in the domestic price index, thus further reducing the real money supply and domestic absorption.²⁰ Relative to adjustment under a flexible exchange rate regime, the lower level of domestic absorption reduces the danger of a current account deficit under fixed exchange rates.

Devaluation can help limit the structural unemployment problem only if monetary and fiscal discipline curtails domestic absorption.²¹ The instantaneous price jump resulting from devaluation, however, also exacerbates inflationary expectations and wage pressure. Relative to adjustment process with flexible exchange rates, adjustment under a fixed exchange rate regime may exacerbate domestic poverty if it is to be effective in moderating structural adjustment. Across-the-board cuts in subsidies accompanied by extensive devaluation, introduction of a fixed exchange rate regime, and wage discipline were implemented in the Czech and Slovak Republics (beginning in 1991) and in Poland (in 1990).

3. 4. Tax and Welfare

Because the cut in the producer subsidy represents a negative supply shock in the nontradables sector, the government is likely to achieve its policy objectives more effectively through supply management (specifically a tax cut). A tax cut would lower the production costs in both sectors and reduce the dead-weight loss to the economy. Consistent with the elasticities in equations (4) and (5), a tax cut would also enhance demand in both sectors, thus partly offsetting the decline in demand for nontradables following the subsidy cut.²² With high price elasticities and a high propensity to consume (equations 4 and 5), however, the increase in the demand for tradables could destabilize the current account.

The tax reduction would increase employment and long-term full-employment output in both sectors. If the price elasticity of supply is greater than the price elasticity of demand, the positive supply effect prevails, leading to a current account surplus.

The reduction in the subsidy worsens the consumers welfare. The tax cut would increase the purchasing power of the higher-income households while not fully offsetting the drop in the purchasing power of the lower-income households. To prevent the lowest-income and benefit-dependent households from falling into poverty, the government could use part of its subsidy savings for household transfers. In fact, with a pareto-efficiency objective, the efficiency gain accruing from replacing the producer subsidy with a lump-sum, targeted household transfer pays for the tax cut.

The replacement of the subsidy with targeted household transfers may involve some administrative costs, but these costs would not be significant in transition economies, where a system of social welfare is already in place. Transition countries that have reduced taxes and have

successfully developed a new transfer system without generating fiscal deficits include Slovenia and the Czech and Slovak Republics.

3. 5. Investment Liberalization and Tourism

Experiences in the transition economies reveal that governments can moderate the negative effects of a cut in the subsidy to nontradables production in other ways as well. These possibilities, including support of investment in the tradables sector and in tourism, go beyond the scope of this paper, but provide an interesting extension to the above analysis.

In transition, privatization, demonopolization, and liberalization of foreign trade and capital are likely to enhance private investment and productivity in both the nontradables and tradables sectors. Positive supply effects depend on the development of adequate regulatory frameworks and sensible treatment of foreign capital.²³ Investment in both sectors would also have a positive effect on demand, as it is likely to boost demand for nontradables (utilities, construction, transport and services). Hungary, the Czech Republic, and Poland, among others, have successfully adopted this investment-friendly approach.

Investment in tourism may be particularly attractive for transition economies. Foreign tourists create added demand for nontradables without causing internal imbalance or creating external liabilities. In addition, tourism generates domestic income, thus partly offsetting the transitory decline in domestic absorption.²⁴ Evidence from Hungary and the Czech Republic suggests that tourism there has had a strong positive impact on their economies.

4. Policy Mix in Transition

The model and analysis of the macroeconomic effects of nontradables inflation was applied to a simple case of a cut in the production subsidy in the nontradables sector during transition. The

analysis was then extended to consider the effectiveness of alternative macroeconomic policies commonly used to moderate adjustment to a subsidy cut (or price liberalization in general).

The analysis indicates that a tax cut and targeted transfers to households are superior to expansionary monetary and fiscal policies. If the total size of the tax cut remains below the size of the subsidy cut, and targeted lump-sum household transfers are financed from government savings, the risks of external imbalance and poverty are reduced. The analysis also indicates that the possible benefits from exchange rate management depend on the wage discipline in the economy.

Endnotes

1. Some specific features of this two-sector model stem from the works of Bruno (1976), Frenkel and Mussa (1985), and De Grauwe (1985 and 1989).
2. The definition of the real exchange rate $q = s \cdot p_T^* - p_N = p_T - p_N$ is consistent with the assumptions and purpose of this model. Edwards (in Calvo et al., 1989) shows four other real exchange rate definitions. For simplification the model assumes that all government expenditure is on nontradables.
3. For a fixed exchange rate, $ds = 0$, and constant world market price of tradables, $dp_T^* = 0$, the domestic inflation rate depends upon the change in the price of nontradables only, $dp/dt = (1-\alpha)dp_N/dt$. An x percent increase in the price of nontradables raises the domestic price level by $(1-\alpha)x$ percent.
4. As a price taker, a small open economy faces infinitely elastic demand for its tradables if there is perfect substitutability between foreign and domestic traded goods. De Grauwe (1985) explains the consequences of such a case.
5. This analysis holds as long as there is no change in the relative productivity levels in the home country and abroad. This model assumes no productivity growth and thus no change in the price of nontradables as a result of the productivity growth differential between the tradables and nontradables sectors. For models explaining the price effects of the productivity growth differential see Froot and Rogoff (1994) or De Grauwe (1985).
6. Output of nontradables is a function of the relative price of nontradables; output of tradables is a function of the real exchange rate. With a given price of tradables and identical consumption baskets in the home country and abroad, productivity in the domestic tradables

sector fully determines the equilibrium domestic level of wage. In the long run, labor mobility in the home country, equalizes the wage in both sectors, $w_N = \delta w_T$, where δ measures the extent of wage spillover between the two sectors, and $\delta = 1$ in the long run. If labor is perfectly mobile, $\delta = 1$ in the short run. The wage level and the relative productivity levels in the two sectors then determine the equilibrium price of nontradables.

The supply curve in both sectors reflects the price of own goods and the wage, w . Solution of the labor market equilibrium wage, $N^S(w/P) = N^D_T(w/P_T) + N^D_N(w/P_N)$, then shows $Y_T = Y_T(P_T/w) = Y_T(P_T/P_N)$ and $Y_N = Y_N(P_N/w) = Y_N(P_N/P_T)$. See, for example, Dornbusch (1988), Marston (1985), or Bruce and Purvis (1985).

7. This analysis contrasts with the Balassa-Samuelson framework. Assuming perfect capital mobility, perfect competition in the goods and factors markets, and the law of one price for tradable goods, the Balassa-Samuelson model shows that the relative price of nontradables is determined entirely by the production side of the economy. In particular, in a small open economy with perfect factor mobility, demand factors affect only affect the country's consumption basket, not relative prices. See, for example, Froot and Rogoff (1994).

8. The strength of the supply reaction depends on the elasticity of substitution between the traded and nontraded goods (curvature of the production transformation curve). The extent of the demand reaction depends on the substitution elasticity of demand (curvature of the indifference curve). If both the supply and demand elasticities for nontradables are high, after the price change materializes excess demand negatively affects balance of payments. See Salter (1959).

9. In a two-sector economy where one sector produces nontradables, there is no difference in the definitions of the trade account and the current account. These terms are thus used

interchangeably in the following analysis. Identical levels of demand for and supply of tradables define the external balance. Equality of demand for and full employment supply of nontradables defines the internal balance. See Dornbusch (1988).

10. From the PPP condition (1), change in exchange rate is associated with a proportional change price of tradables. Compared to the tradables price, the price of nontradables moves in the same direction but less than proportionally.

The relative price gives the critical signal for factor allocation across the sectors (section 2.4). Its decline would encourage a reallocation of factors from the nontradables to the tradables production sector. Structural adjustment leading to an excess supply in the domestic tradable sector would allow the economy to move toward a balance in the current account. (For a discussion of the role of the relative price for structural adjustment, see, e.g., Krugman, 1990 and Dornbusch, 1988.)

11. For details regarding the wage effects in a two-sector open economy see Schembri (1988).

12. The increase in the real interest rate would also partly offset the initial shock in the relative price of nontradables and would create downward pressure on the price of nontradables and thus on the relative price on nontradables, reflecting the price elasticity of demand for nontradables, ϵ_N in equation (4). See Froot and Rogoff (1994).

13. Dornbusch (1988) showed how the relative price influences the adjustment mechanism on the supply side of the economy.

14. In a general Keynesian policy analysis, growth of national wealth should also be considered as a policy objective; it is not dealt with here because the presented model does not address productivity. With respect to the solvency of the public sector, long-run objectives

include a balanced government budget. For a general Keynesian policy analysis see, for example, Meade and Vines (1988).

15. The increase in the price of nontradables is exacerbated when production of nontradables exhibits increasing returns to scale (as in the case of natural monopolies, for example). The drop in demand for nontradables following the initial price rise would lead to an additional increase in the price of nontradables. In many transition countries this upward price spiral and a decline in output followed the cut in the subsidy to utilities until a declining price elasticity of demand or price regulation stopped the process.

16. See Mundell (1967) and Fleming (1962).

17. The relative price is not altered if the disturbance is only monetary. As Bruce and Purvis (1985) explain, with trade balance as a condition in the long run and an endogenous money supply, the real exchange rate does not change in the long run, and the prices of nontradables and tradables prices move to the same extent as the exchange rate, $dP_N = dP_T = dS$.

18. For a comprehensive comparison of the macroeconomic policies related to subsidy cuts during transition, see World Bank (1996).

19. Government spending needs to be restricted to nontradables for fiscal policy to effectively boost employment. For a detailed explanation, see Helpman (1977).

20. As noted before, this effect is greater the greater are the price and substitution elasticities. With respect to devaluation, this condition is rephrased by Helpman (1977) who shows that the trade account improves if and only if the effective relative size of the nontradables sector exceeds the marginal propensity to consume the nontraded commodity. In the case considered, the nontradables sector is large enough to accommodate the increase in the expenditure share on

nontradables at the lower level of real incomes.

21. For a reconciliation of different approaches to the analysis of devaluation effectiveness see Michaely (1960).

22. Since there is recession in the medium term, both Keynesians (who support discretionary demand management) and Neoclassical economists (who support intertemporal smoothing of distortionary tax rates) would allow a medium-term budget deficit to smooth consumption over time and across states of nature. For simplicity, the analysis here observes the "golden rule" government financing (balance in the current budget) rather than an intertemporal budget constraint.

23. For example, Salter (1959) analyzed the role of capital inflows during recession.

24. Copeland (1991) analyzes the welfare gain as well as the macroeconomic risks stemming from tourism. Through its effect on relative prices, tourism may slow down factor reallocation into the tradables sector. In fact, massive consumption of nontradables by tourists may lead to a shift in definition, as previously nontraded services may surpass the threshold of tradability. With tourism, external balance is not at risk. Copeland (1991) demonstrates that tourist demand may bias the composition of the national output away from tradables.

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